

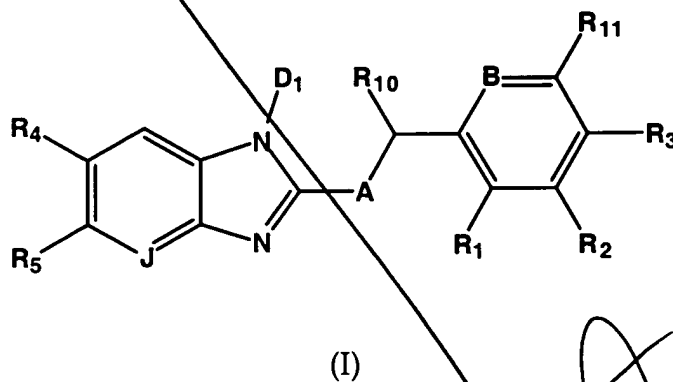
## CLAIMS

What is claimed is:

1. A proton pump inhibitor compound comprising at least one NO group, at least one NO<sub>2</sub> group, or at least one NO and NO<sub>2</sub> group, or a pharmaceutically acceptable salt thereof.

2. The proton pump inhibitor compound of claim 1, wherein the compound comprising at least one NO group, at least one NO<sub>2</sub> group, or at least one NO and NO<sub>2</sub> group is a compound of formula (I), formula (II), formula (III), formula (IV), formula (V), formula (VI) or formula (VII), or a pharmaceutically acceptable salt thereof:

wherein the compound of formula (I) is:



wherein

A is S, S(O), or S(O)<sub>2</sub>;

B is -CNR<sub>7</sub>R<sub>7</sub>' or nitrogen;

J is CH or nitrogen;

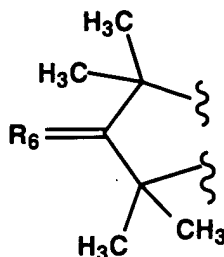
R<sub>1</sub> is a hydrogen, an alkoxy group, a lower alkyl group, or an alkylthio group;

R<sub>2</sub> is a hydrogen, an alkoxy group, a lower alkyl group, an alkylthio group, a haloalkoxy group, an alkoxyalkyl group, -NR<sub>7</sub>R<sub>7</sub>', -OD<sub>1</sub>, or -SD<sub>1</sub>; or R<sub>2</sub> and R<sub>1</sub> taken together with the carbon chain to which they are attached form a cycloalkyl ring or a heterocyclic ring; or R<sub>2</sub> and R<sub>3</sub> taken together with the carbon chain to which they are attached form a cycloalkyl ring or a heterocyclic ring;

R<sub>3</sub> and R<sub>11</sub> are each independently a hydrogen, an alkoxy group, a lower alkyl group, or an alkylthio group; or R<sub>3</sub> and R<sub>11</sub> taken together with the carbon chain to

which they are attached form a cycloalkyl ring or a heterocyclic ring;

$R_4$  and  $R_5$  are each independently a hydrogen, an alkyl group, a halo group, an alkoxy group, a haloalkyl group, a haloalkoxy group, a cyano group, an aryl group, a heterocyclic ring,  $-NR_7R_7'$ ,  $-OD_1$ , or  $-CO_2R_{12}$ ; or  $R_4$  and  $R_5$  taken together are:



wherein

$R_6$  is oxygen or  $N=O-R_7$ ;

$R_7$  and  $R_7'$  are each independently hydrogen, a lower alkyl group or D; or  $R_7$  and  $R_7'$  taken together with the nitrogen to which they are attached form a heterocyclic ring;

$R_{10}$  is a hydrogen; or  $R_{10}$  and  $R_1$  taken together with the carbon chain to which they are attached form a cycloalkyl ring;

$R_{12}$  is a lower alkyl group or D;

$D_1$  is a hydrogen or D;

D is Q or K;

Q is  $-NO$  or  $-NO_2$ ;

K is  $-W_a-E_b-(C(R_e)(R_f))_p-E_c-(C(R_e)(R_f))_x-W_d-(C(R_e)(R_f))_y-W_i-E_j-W_g-(C(R_e)(R_f))_z-T-Q$ ;

a, b, c, d, g, i and j are each independently an integer from 0 to 3;

p, x, y and z are each independently an integer from 0 to 10;

W at each occurrence is independently  $-C(O)-$ ,  $-C(S)-$ ,  $-T-$ ,  $-(C(R_e)(R_f))_h-$ , an alkyl group, an aryl group, a heterocyclic ring, an arylheterocyclic ring, or  $-(CH_2CH_2O)_q-$ ;

E at each occurrence is independently  $-T-$ , an alkyl group, an aryl group,  $-(C(R_e)(R_f))_h-$ , a heterocyclic ring, an arylheterocyclic ring, or  $-(CH_2CH_2O)_q-$ ;

h is an integer from 1 to 10;

q is an integer from 1 to 5;

$R_e$  and  $R_f$  are each independently a hydrogen, an alkyl, a cycloalkoxy, a

halogen, a hydroxy, an hydroxyalkyl, an alkoxyalkyl, an arylheterocyclic ring, an  
alkylaryl, a cycloalkylalkyl, a heterocyclicalkyl, an alkoxy, a haloalkoxy, an amino, an  
alkylamino, a dialkylamino, an arylamino, a diarylamino, an alkylarylamino, an  
alkoxyhaloalkyl, a haloalkoxy, a sulfonic acid, a sulfonic ester, an alkylsulfonic acid,  
5 an arylsulfonic acid, an arylalkoxy, an alkylthio, an arylthio, a cycloalkylthio, a  
cycloalkenyl, a cyano, an aminoalkyl, an aminoaryl, an aryl, an arylalkyl, an  
alkylaryl, a carboxamido, an alkylcarboxamido, an arylcarboxamido, an amidyl, a  
carboxyl, a carbamoyl, an alkylcarboxylic acid, an arylcarboxylic acid, an  
alkylcarbonyl, an arylcarbonyl, an ester, a carboxylic ester, an alkylcarboxylic ester, an  
10 arylcarboxylic ester, a haloalkoxy, a sulfonamido, an alkylsulfonamido, an  
arylsulfonamido, a sulfonic ester, a urea, a phosphoryl, a nitro, -T-Q, or  $(C(R_e)(R_f))_k$ -  
T-Q, or  $R_e$  and  $R_f$  taken together with the carbons to which they are attached form a  
carbonyl, a methanthial, a heterocyclic ring, a cycloalkyl group or a bridged cycloalkyl  
group;

k is an integer from 1 to 3;

T at each occurrence is independently a covalent bond, a carbonyl, an oxygen,  
-S(O)<sub>o</sub>- or -N(R<sub>a</sub>)R<sub>f</sub>-;

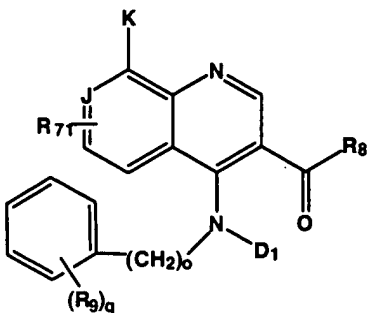
o is an integer from 0 to 2;

R<sub>a</sub> is a lone pair of electrons, a hydrogen or an alkyl group;

20 R<sub>f</sub> is a hydrogen, an alkyl, an aryl, an alkylcarboxylic acid, an arylcarboxylic  
acid, an alkylcarboxylic ester, an arylcarboxylic ester, an alkylcarboxamido, an  
arylcarboxamido, an alkylaryl, an alkylsulfinyl, an alkylsulfonyl, an arylsulfinyl, an  
arylsulfonyl, a sulfonamido, a carboxamido, a carboxylic ester, an amino alkyl, an  
amino aryl, -CH<sub>2</sub>-C(T-Q)(R<sub>e</sub>)(R<sub>f</sub>), or -(N<sub>2</sub>O<sub>2</sub>)<sup>-</sup>•M<sup>+</sup>, wherein M<sup>+</sup> is an organic or  
25 inorganic cation; with the proviso that when R<sub>f</sub> is -CH<sub>2</sub>-C(T-Q)(R<sub>e</sub>)(R<sub>f</sub>) or -(N<sub>2</sub>O<sub>2</sub>)<sup>-</sup>  
•M<sup>+</sup>, or R<sub>e</sub> or R<sub>f</sub> are T-Q or  $(C(R_e)(R_f))_k$ -T-Q, then the "-T-Q" subgroup can be a  
hydrogen, an alkyl, an alkoxy, an alkoxyalkyl, an aminoalkyl, a hydroxy, a  
heterocyclic ring or an aryl group; and

30 with the proviso that the compound of formula (I) must contain at least one  
nitrite, nitrate, thionitrite or thionitrate group;

wherein the compound of formula (II) is:



II

wherein

R<sub>8</sub> is a lower alkyl group, an alkoxyalkyl group, an alkylaryl group, a cycloalkyl group, a cycloalkylalkyl group, an aryl group, an alkylaryl group, or K;

R<sub>9</sub> at each occurrence is independently a hydrogen, a lower alkyl group, an alkylthio group, a halogen, a cyano group, an alkanoyl group, a haloalkyl group, a carbamoyl group, -NR<sub>7</sub>D<sub>1</sub>, -OD<sub>1</sub>, or -CO<sub>2</sub>R<sub>12</sub>;

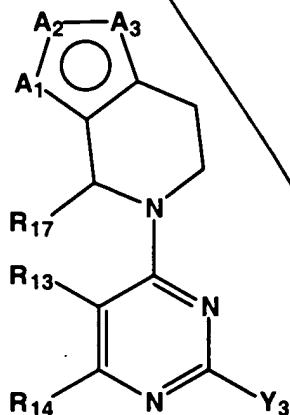
R<sub>71</sub> is a hydrogen, a lower alkyl group, an alkoxy group, or -OD<sub>1</sub>;

J, K, D<sub>1</sub>, R<sub>7</sub>, R<sub>12</sub>, q and o are as defined herein; and

with the proviso that the compound of formula (II) must contain at least one nitrite, nitrate, thionitrite or thionitrate group;

wherein the compound of formula (III) is:

wherein



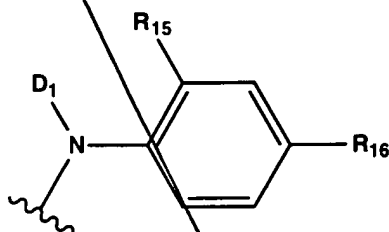
III

$R_{13}$  and  $R_{14}$  are each independently a hydrogen a lower alkyl group, an alkoxyalkyl, or a lower alkyl- $OD_1$ ; or  $R_{13}$  and  $R_{14}$  taken together along with the carbons to which they are attached form a cycloalkyl group or an aryl group;

$R_{17}$  is a hydrogen or a lower alkyl group;

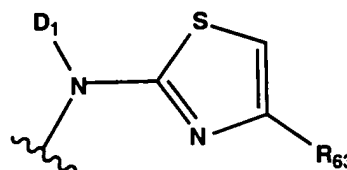
$Y_3$  is:

(a)



(b)

or



wherein

$R_{15}$  is a hydrogen or a lower alkyl group;

$R_{16}$  is a hydrogen, a halogen, or a lower alkyl group;

$R_{63}$  is a lower alkyl group or a phenyl group;

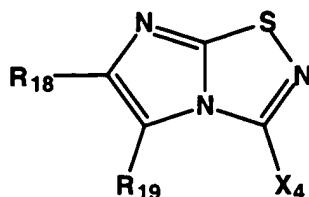
$A_1$ ,  $A_2$  and  $A_3$  comprise the other subunits of a 5- or 6-membered monocyclic aromatic ring and  $A_1$ ,  $A_2$  and  $A_3$  are each independently:

- (i)  $CR_o$ , wherein  $R_o$  at each occurrence is hydrogen or  $-OD_1$ ;
- (ii)  $N-R_p$ , wherein  $R_p$  at each occurrence is independently a covalent bond to an adjacent ring atom in order to render the ring aromatic, a hydrogen, or  $K$ ;
- (iii) a sulfur atom;
- (iv) an oxygen atom; or
- (v)  $B_a = B_b$ , wherein  $B_a$  and  $B_b$  are each independently a nitrogen atom or  $CR_o$ ; wherein  $R_o$  at each occurrence is hydrogen or  $-OD_1$ ;

$D_1$  and  $K$  are as defined herein; and

with the proviso that the compound of formula (III) must contain at least one nitrite, nitrate, thionitrite or thionitrate group;

wherein the compound of formula (IV) is:



IV

wherein

$R_{18}$  and  $R_{19}$  at each occurrence are each independently a hydrogen, a lower alkyl group, a halogen, a nitro group, an alkoxy group,  $-OD_1$ ,  $-NR_{20}R_{21}$ ,  $-O(O)CR_{20}$ ,  $-O(O)COR_{20}$ ,  $-O(O)CNR_{20}R_{21}$ ,  $-N(R_{20})C(O)R_{21}$ ,  $-N(R_{20})C(O)NR_{20}R_{21}$ , or  $-N(R_{20})C(O)OR_{21}$ ; or  $R_{18}$  and  $R_{19}$  when taken together along with the carbons to which they are attached form a heterocyclic ring or a phenyl ring optionally substituted with up to four substituents selected from a hydrogen, a lower alkyl group, a halogen, a nitro group, an alkoxy group,  $-OD_1$ ,  $-NR_{20}R_{21}$ ,  $-O(O)CR_{20}$ ,  $-O(O)COR_{20}$ ,  $-O(O)CNR_{20}R_{21}$ ,  $-N(R_{20})C(O)R_{21}$ ,  $-N(R_{20})C(O)NR_{20}R_{21}$ , or  $-N(R_{20})C(O)OR_{21}$ ;

$R_{20}$  and  $R_{21}$  at each occurrence are each independently a hydrogen, a lower alkyl group, an aryl group, a lower alkylaryl group, or K;

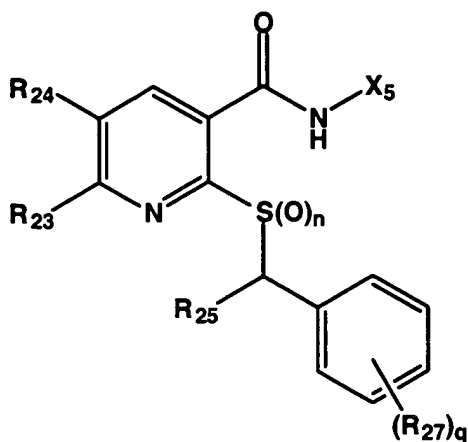
$X_4$  is  $-C(=R_6)R_{22}$ , a heterocyclic ring,  $-NR_{20}R_{21}$ , a halogen, an alkoxy group, an arylalkoxy group, a cycloalkoxy group, a heterocyclicalkoxy group, an alkylsulfonyl group, an alkylsulfinyl group, an arylsulfonyl group, an arylsulfinyl group, an arylalkylsulfonyl group, an arylalkylsulfinyl group, a heterocyclicsulfonyl group, or a heterocyclicsulfinyl group;

$R_{22}$  is a hydrogen, an alkyl group, an alkoxy group, an aryl group, an alkylaryl group, a heterocyclic ring, an  $-O$ -heterocyclic ring, or an alkylheterocyclic ring;

$D_1$ ,  $R_6$ , and K are defined as herein; and

with the proviso that the compound of formula (IV) must contain at least one nitrite, nitrate, thionitrite or thionitrate group;

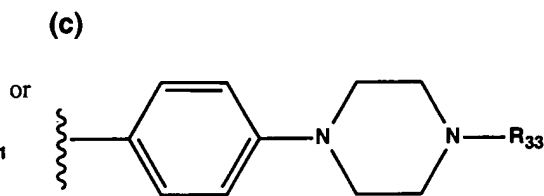
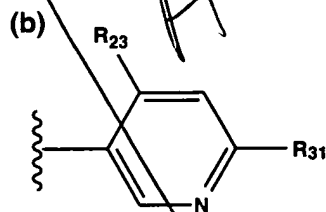
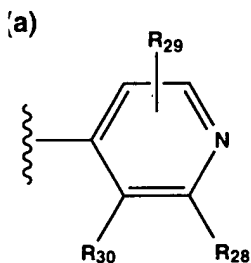
wherein the compound of formula (V) is:



(V)

wherein

$X_5$  is:



$R_{23}$  is a hydrogen, a dialkylamino group,  $-NR_7R_7'$ , or a heterocyclic ring;

$R_{24}$  is a hydrogen or halogen;

$R_{25}$  is a hydrogen,  $-OD_1$ , or lower alkyl- $OD_1$ ;

$R_{27}$  at each occurrence is independently a hydrogen or an alkoxy group;

$R_{28}$ ,  $R_{29}$ , and  $R_{30}$  are each independently a hydrogen, a lower alkyl group, a dialkylamino group, a heterocyclic ring, or a lower alkyl- $OD_1$ ;

$R_{31}$  is a hydrogen, a dialkylamino group, or an alkoxy group;

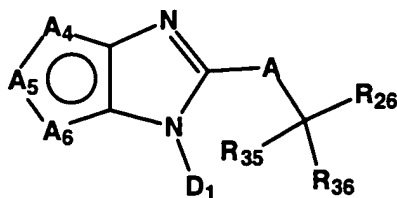
$R_{33}$  is a hydrogen or a lower alkyl group;

$n$  is an integer from 0 to 1;

$R_7$ ,  $R_7'$ ,  $D_1$  and  $q$  are as defined herein; and

with the proviso that the compound of formula (V) must contain at least one nitrite, nitrate, thionitrite or thionitrate group;

wherein the compound of formula (VI) is:



VI

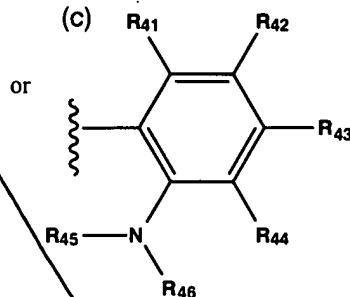
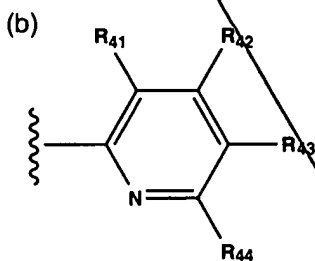
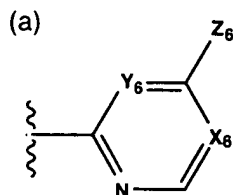
wherein

$A_4$ ,  $A_5$ , and  $A_6$  are each independently a sulfur or  $CR_{34}$  with the proviso that one of  $A_4$ ,  $A_5$ , or  $A_6$  is a sulfur and the other two are  $CR_{34}$ ;

$R_{34}$  at each occurrence is independently a hydrogen, a halogen, a cyano, a nitro, a trifluoromethyl, a lower alkyl group, a heterocyclic ring, a lower alkyl-OD<sub>1</sub>, an alkoxy, a haloalkoxy, an alkylthio, an alkylsulfinyl, an alkylsulfonyl, an alkylcarbonyl, an alkoxycarbonyl, a carbamoyl, a N-alkylcarbamoyl, a N,N-di-alkylcarbamoyl, an ester, a cycloalkyl, an aryl, an alkylaryl, an aryloxy, an arylalkoxyoxy, an arylamino, a alkylarylamino, an arylthio, an arylsulfonyl, an arylsulfinyl, or a sulfonamido;

$R_{35}$  and  $R_{36}$  are each independently a hydrogen or a lower alkyl group; or  $R_{35}$  and  $R_{41}$  taken together with the carbon chain to which they are attached form a cycloalkyl ring;

$R_{26}$  is:



wherein

$X_6$  is nitrogen, and  $Y_6$  is  $CR_{37}$ ; or  $X_6$  is  $CR_{37}$ , and  $Y_6$  is nitrogen;

$R_{37}$  is a hydrogen, a halogen, a lower alkyl group, a trifluoromethyl, an alkoxy



group, a haloalkoxy group, an aryl group, an arylalkoxy group, a heterocyclic ring, or an aryloxy;

$Z_6$  is  $-NR_{38}R_{39}$ ,  $SR_{40}$ , or an arylalkoxy group;

$R_{38}$  and  $R_{39}$  are each independently a hydrogen, a lower alkyl group, an aryl group, an alkylaryl group, or a cycloalkyl group; or  $R_{38}$  and  $R_{39}$  taken together with the nitrogen to which they are attached form a heterocyclic ring;

$R_{40}$  is a hydrogen, a halogen, a lower alkyl group, an alkylaryl group, an alkenyl group, or a haloalkyl group;

$R_{41}$ ,  $R_{42}$ ,  $R_{43}$ , and  $R_{44}$  are each independently a hydrogen, a halogen, a lower alkyl group, an alkoxy group, a haloalkoxy group, an alkoxyaryl group, an alkylthio group, an alkylsulfinyl group, an alkylsulfonyl group, a cyano group,  $-Y-OD_1$ ,  $-Y-SD_1$ ,  $-Y-NR_{20}R_{21}$ ,  $-Y-O(O)CR_{20}$ ,  $-Y-O(O)CNR_{20}R_{21}$ ,  $-Y-N(R_{20})C(O)R_{21}$ , or  $-Y-N(R_{20})S(O)_2R_{21}$ ;

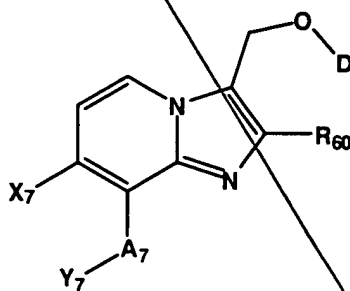
$Y$  is  $-(CH_2)_a-$  or a phenyl group;

$R_{45}$  and  $R_{46}$  are each independently a hydrogen, a lower alkyl group, a cycloalkyl group, an alkenyl group, or an alkynyl group;

$D_1$ ,  $R_{20}$ ,  $R_{21}$ , and  $a$  are as defined herein; and

with the proviso that the compound of formula (VI) must contain at least one nitrite, nitrate, thionitrite or thionitrate group;

wherein the compound of formula (VII) is:



VII

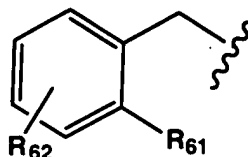
wherein

$R_{60}$  is a lower alkyl group, an aryl group, a haloalkyl group, a lower alkyl- $OD_1$ , or heterocyclic ring;

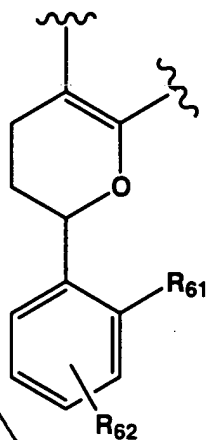
$A_7$  is oxygen or  $-ND_1$ ;

$X_7$  is a hydrogen or a halogen;

$Y_7$  is:



or  $X_7$ ,  $A_7$ , and  $Y_7$  taken together along with the carbons to which they are attached is:



wherein

$R_{61}$  is a hydrogen, a halogen, a lower alkyl group,  $-OD_1$ , or  $-NHC(O)O$ -lower alkyl;

$R_{62}$  is a hydrogen, a halogen, or a lower alkyl group; and

$D_1$  is as defined herein.

3. The compound of claim 2, wherein the compound is a benzimidazole, a quinoline, a pyrimidine, a thiadiazole, a sulfinylnicotinamide, a thienoimidazole, or a imidazopyridine.

4. The compound of claim 3, wherein the benzimidazole is omeprazole, lansoprazole, pantoprazole, rabeprazole, leminoprazole, timoprazole, tenatoprazole, disulprazole, esomeprazole, 2-(2-benzimidazolyl)-pyridine, a tricyclic imidazole, a thienopyridine benzimidazole, a fluoroalkoxy substituted benzimidazole, a dialkoxy benzimidazole, a N-substituted 2-

(pyridylalkenesulfinyl) benzimidazole, a cycloheptenepyridine, a 5-pyrrolyl-2-pyridylmethylsulfinyl benzimidazole, a alkylsulfinyl benzimidazole, a fluoro-pyridylmethylsulfinyl benzimidazole, an imidazo[4,5-b]pyridine, RO 18-5362 or IY 81149; wherein the quinoline is a 4-amino-3-carbonyl quinoline, a 4-amino-3-acylnaphthylide, a 4-aminoquinoline, a 4-amino-3-acylquinoline or a 3-butyryl-4-(2-methylphenylamino)-8-(2-hydroxyethoxy)quinoline; wherein the pyrimidine is a quinazoline, a tetrahydroisoquinolin-2-yl pyrimidine or YH 1885; wherein the thiadiazole is 3-substituted 1,2,4-thiadiazolo[4,5-a] benzimidazole or a 3-substituted imidazo[1,2-d]-thiadiazole; wherein the sulfinylnicotinamide is a 2-sulfinylnicotinamide; wherein the thienoimidazole is a pyridylsulfinylbenzimidazole, a pyridylsulfinyl thieno imidazole, a theinoimidazole-toluidine, a 4,5-dihydrooxazole, a thienoimidazole-toluidine or Hoe-731; wherein the imidazopyridine is a imidazo[1,2-a]pyridine, a pyrrolo[2,3-b]pyridine or a pharmaceutically acceptable salt thereof.

5. A composition comprising the compound of claim 2 and a pharmaceutically acceptable carrier.

6. The composition of claim 5, further comprising at least one of a nonsteroidal antiinflammatory drug, a selective COX-2 inhibitor, an antacid, a bismuth-containing reagent, and an acid-degradable antibacterial compound.

7. A method for treating or preventing a gastrointestinal disorder, facilitating ulcer healing, or decreasing the recurrence of an ulcer in a patient in need thereof comprising administering to the patient a therapeutically effective amount of the composition of claim 5.

8. The method of claim 7, further comprising administering to the patient a therapeutically effective amount of an antacid.

9. The method of claim 7, wherein the gastrointestinal disorder is an inflammatory bowel disease, Crohn's disease, irritable bowel syndrome, ulcerative colitis, a peptic ulcer, a stress ulcers, a bleeding peptic ulcer, a duodenal ulcer, infectious enteritis, colitis, diverticulitis, gastric hyperacidity, dyspepsia, gastroparesis, Zollinger-Ellison syndrome, gastroesophageal reflux disease, *Helicobacter Pylori* associated disease, short-bowel syndrome, or a hypersecretory state associated with systemic mastocytosis or basophilic leukemia and

hyperhistaminemia.

10. A method for improving the gastroprotective properties, the anti-*Helicobacter pylori* properties, or the antacid properties of a proton pump inhibitor comprising administering to a patient in need thereof a therapeutically effective amount of the composition of claim 5.

11. The method of claim 10, further comprising administering to the patient a therapeutically effective amount of a bismuth-containing reagent.

12. A method for decreasing or reversing gastrointestinal toxicity or facilitating ulcer healing resulting from administration of a nonsteroidal antiinflammatory drug and/or a selective COX-2 inhibitor to a patient comprising administering to a patient in need thereof a therapeutically effective amount of at least one composition of claim 5, and, optionally, at least one nonsteroidal antiinflammatory drug and/or selective COX-2 inhibitor.

13. A method for treating *Helicobacter pylori* comprising administering to a patient in need thereof a therapeutically effective amount of at least one acid degradable antibacterial compound and at least one composition of claim 5.

14. A method for treating a viral infection comprising administering to a patient in need thereof a therapeutically effective amount of the composition of claim 5.

15. The method of claim 14, wherein the viral infection is orthomyxoviridae, paramyxoviridae, picornaviridae, rhabdoviridae, coronaviridae, togaviridae, bunyaviridae, arenaviridae, reteroviridae, adenoviridae, proxviridae, papovaviridae, herpetoviridae, herpesviridae, herpes simplex viruses, cytomegalovirus, herpes varicella-zoster, Epstein-Barr, HHV6, HHV7, pseudorabies or rhinotracheitis.

16. A composition comprising at least one compound of claim 2 or a pharmaceutically acceptable salt thereof, and at least one compound that donates, transfers or releases nitric oxide, or induces the production of endogenous nitric oxide or endothelium-derived relaxing factor, or is a substrate for nitric oxide synthase.

17. The composition of claim 16 further comprising a pharmaceutically acceptable carrier.

18. The composition of claim 16, wherein the compound that donates, transfers, or releases nitric oxide, or induces the production of endogenous nitric oxide or endothelium-derived relaxing factor or is a substrate for nitric oxide synthase is an S-nitrosothiol.

19. The composition of claim 18, wherein the S-nitrosothiol is S-nitroso-N-acetylcysteine, S-nitroso-captopril, S-nitroso-N-acetylpenicillamine, S-nitroso-homocysteine, S-nitroso-cysteine or S-nitroso-glutathione.

20. The composition of claim 16, wherein the S-nitrosothiol is:

(i)  $\text{HS}(\text{C}(\text{R}_e)(\text{R}_f))_m\text{SNO}$ ;

(ii)  $\text{ONS}(\text{C}(\text{R}_e)(\text{R}_f))_m\text{R}_e$ ; and

(iii)  $\text{H}_2\text{N}-\text{CH}(\text{CO}_2\text{H})-(\text{CH}_2)_m-\text{C}(\text{O})\text{NH}-\text{CH}(\text{CH}_2\text{SNO})-\text{C}(\text{O})\text{NH}-\text{CH}_2-\text{CO}_2\text{H}$ ;

wherein m is an integer from 2 to 20;  $\text{R}_e$  and  $\text{R}_f$  are each independently a hydrogen, an alkyl, a cycloalkoxy, a halogen, a hydroxy, an hydroxyalkyl, an alkoxyalkyl, an arylheterocyclic ring, an alkylaryl, a cycloalkylalkyl, a heterocyclicalkyl, an alkoxy, a haloalkoxy, an amino, an alkylamino, a dialkylamino, an arylamino, a diarylamino, an alkylaryl amino, an alkoxyhaloalkyl, a haloalkoxy, a sulfonic acid, a sulfonic ester, an alkylsulfonic acid, an arylsulfonic acid, an arylalkoxy, an alkylthio, an arylthio, a cycloalkylthio, a cycloalkenyl, a cyano, an aminoalkyl, an aminoaryl, an aryl, an arylalkyl, an alkylaryl, a carboxamido, an alkylcarboxamido, an arylcarboxamido, an amidyl, a carboxyl, a carbamoyl, an alkylcarboxylic acid, an arylcarboxylic acid, an alkylcarbonyl, an arylcarbonyl, an ester, a carboxylic ester, an alkylcarboxylic ester, an arylcarboxylic ester, a haloalkoxy, a sulfonamido, an alkylsulfonamido, an arylsulfonamido, a sulfonic ester, a urea, a phosphoryl, a nitro, -T-Q, or  $(\text{C}(\text{R}_e)(\text{R}_f))_k$ -T-Q, or  $\text{R}_e$  and  $\text{R}_f$  taken together with the carbons to which they are attached form a carbonyl, a methanthial, a heterocyclic ring, a cycloalkyl group or a bridged cycloalkyl group; Q is -NO or -NO<sub>2</sub>; and T is independently a covalent bond, a carbonyl, an oxygen, -S(O)<sub>o</sub>- or -N(R<sub>a</sub>)R<sub>f</sub>-, wherein o is an integer from 0 to 2, R<sub>a</sub> is a lone pair of electrons, a hydrogen or an alkyl group; R<sub>f</sub> is a hydrogen, an alkyl, an aryl, an alkylcarboxylic acid, an aryl carboxylic acid, an alkylcarboxylic ester, an arylcarboxylic ester, an alkylcarboxamido, an arylcarboxamido, an alkylaryl, an alkylsulfinyl, an alkylsulfonyl, an arylsulfinyl, an arylsulfonyl, a sulfonamido, a carboxamido, a carboxylic ester, an amino alkyl, an amino aryl, -CH<sub>2</sub>-C(T-Q)(R<sub>e</sub>)(R<sub>f</sub>), or  $(\text{N}_2\text{O}_2)^-\bullet\text{M}^+$ ,

wherein  $M^+$  is an organic or inorganic cation; with the proviso that when  $R_i$  is  $-CH_2-C(T-Q)(R_e)(R_f)$  or  $-(N_2O_2^-) \cdot M^+$ ; then "-T-Q" can be a hydrogen, an alkyl group, an alkoxyalkyl group, an aminoalkyl group, a hydroxy group or an aryl group.

21. The composition of claim 16, wherein the compound that donates, transfers, or releases nitric oxide, or induces the production of endogenous nitric oxide or endothelium-derived relaxing factor, or is a substrate for nitric oxide synthase, is L-arginine, L-homoarginine, N-hydroxy-L-arginine, nitrosated L-arginine, nitrosylated L-arginine, nitrosated N-hydroxy-L-arginine, nitrosylated N-hydroxy-L-arginine, citrulline, ornithine, glutamine, lysine, polypeptides comprising at least one of these amino acids or inhibitors of the enzyme arginase.

22. The composition of claim 16, wherein the compound that donates, transfers, or releases nitric oxide, or induces the production of endogenous nitric oxide or endothelium-derived relaxing factor, or is a substrate for nitric oxide synthase is:

(i) a compound that comprises at least one ON-O-, ON-N- or ON-C-group;

(ii) a compound that comprises at least one  $O_2N-O$ -,  $O_2N-N$ -,  $O_2N-S$ - or  $-O_2N-C$ - group;

(iii) a N-oxo-N-nitrosoamine having the formula:  $R^1R^2-N(O-M^+)-NO$ , wherein  $R^1$  and  $R^2$  are each independently a polypeptide, an amino acid, a sugar, an oligonucleotide, a straight or branched, saturated or unsaturated, aliphatic or aromatic, substituted or unsubstituted hydrocarbon, or a heterocyclic group, and  $M^+$  is an organic or inorganic cation.

23. The composition of claim 22, wherein the compound comprising at least one ON-O-, ON-N- or ON-C- group is an ON-O-polypeptide, an ON-N-polypeptide, an ON-C-polypeptide, an ON-O-amino acid, an ON-N-amino acid, an ON-C-amino acid, an ON-O-sugar, an ON-N-sugar, an ON-C-sugar, an ON-O-oligonucleotide, an ON-N-oligonucleotide, an ON-C-oligonucleotide, a straight or branched, saturated or unsaturated, substituted or unsubstituted, aliphatic or aromatic ON-O-hydrocarbon, a straight or branched, saturated or unsaturated, substituted or unsubstituted, aliphatic or aromatic ON-N-hydrocarbon, a straight or branched, saturated or unsaturated, substituted or unsubstituted, aliphatic or

aromatic ON-C-hydrocarbon, an ON-O-heterocyclic compound, an ON-N-heterocyclic compound or a ON-C-heterocyclic compound.

24. The composition of claim 22, wherein compound comprising at least one O<sub>2</sub>N-O-, O<sub>2</sub>N-N-, O<sub>2</sub>N-S- or O<sub>2</sub>N-C- group is an O<sub>2</sub>N-O-polypeptide, an O<sub>2</sub>N-N-polypeptide, an O<sub>2</sub>N-S-polypeptide, an O<sub>2</sub>N-C-polypeptide, an O<sub>2</sub>N-O-amino acid, O<sub>2</sub>N-N-amino acid, O<sub>2</sub>N-S-amino acid, an O<sub>2</sub>N-C-amino acid, an O<sub>2</sub>N-O-sugar, an O<sub>2</sub>N-N-sugar, O<sub>2</sub>N-S-sugar, an O<sub>2</sub>N-C-sugar, an O<sub>2</sub>N-O-oligonucleotide, an O<sub>2</sub>N-N-oligonucleotide, an O<sub>2</sub>N-S-oligonucleotide, an O<sub>2</sub>N-C-oligonucleotide, a straight or branched, saturated or unsaturated, aliphatic or aromatic, substituted or unsubstituted O<sub>2</sub>N-O-hydrocarbon, a straight or branched, saturated or unsaturated, aliphatic or aromatic, substituted or unsubstituted O<sub>2</sub>N-N-hydrocarbon, a straight or branched, saturated or unsaturated, aliphatic or aromatic, substituted or unsubstituted O<sub>2</sub>N-S-hydrocarbon, a straight or branched, saturated or unsaturated, aliphatic or aromatic, substituted or unsubstituted O<sub>2</sub>N-C-hydrocarbon, an O<sub>2</sub>N-O-heterocyclic compound, an O<sub>2</sub>N-N-heterocyclic compound, an O<sub>2</sub>N-S-heterocyclic compound or an O<sub>2</sub>N-C-heterocyclic compound.

25. The composition of claim 16, further comprising at least one of a nonsteroidal antiinflammatory drug, a selective COX-2 inhibitor, an antacid, a bismuth-containing reagent, and an acid-degradable antibacterial compound.

26. A method for treating or preventing a gastrointestinal disorder, facilitating ulcer healing, or decreasing the recurrence of an ulcer in a patient in need thereof comprising administering to the patient a therapeutically effective amount of the composition of claim 16.

27. The method of claim 26, further comprising administering to the patient a therapeutically effective amount of an antacid.

28. The method of claim 26, wherein the gastrointestinal disorder is an inflammatory bowel disease, Crohn's disease, irritable bowel syndrome, ulcerative colitis, a peptic ulcer, a stress ulcers, a bleeding peptic ulcer, a duodenal ulcer, infectious enteritis, colitis, diverticulitis, gastric hyperacidity, dyspepsia, gastroparesis, Zollinger-Ellison syndrome, gastroesophageal reflux disease, *Helicobacter Pylori* associated disease, short-bowel syndrome, or a hypersecretory state associated with systemic mastocytosis or basophilic leukemia and

hyperhistaminemia.

29. A method for improving the gastroprotective properties, the anti-*Helicobacter pylori* properties, or the antacid properties of a proton pump inhibitor comprising administering to a patient in need thereof a therapeutically effective amount of the composition of claim 16.

30. The method of claim 29, further comprising administering to the patient a therapeutically effective amount of a bismuth-containing reagent.

31. A method for decreasing or reversing gastrointestinal toxicity or facilitating ulcer healing resulting from administration of a nonsteroidal antiinflammatory drug and/or a selective COX-2 inhibitor to a patient comprising administering to a patient in need thereof a therapeutically effective amount of at least one composition of claim 16, and, optionally, at least one nonsteroidal antiinflammatory drug and/or selective COX-2 inhibitor.

32. A method for treating *Helicobacter pylori* comprising administering to a patient in need thereof a therapeutically effective amount of at least one acid degradable antibacterial compound and at least one composition of claim 16.

33. A method for treating a viral infection comprising administering to a patient in need thereof a therapeutically effective amount of the composition of claim 16.

34. The method of claim 33, wherein the viral infection is orthomyxoviridae, paramyxoviridae, picornaviridae, rhabdoviridae, coronaviridae, togaviridae, bunyaviridae, arenaviridae, reteroviridae, adenoviridae, proxviridae, papovaviridae, herpesviridae, herpes simplex viruses, cytomegalovirus, herpes varicella-zoster, Epstein-Barr, HHV6, HHV7, pseudorabies or rhinotracheitis.

35. A composition comprising at least one proton pump inhibitor compound or a pharmaceutically acceptable salt thereof, and at least one compound that donates, transfers or releases nitric oxide, or induces the production of endogenous nitric oxide or endothelium-derived relaxing factor, or is a substrate for nitric oxide synthase.

36. The composition of claim 35, wherein the at least one proton pump inhibitor compound is a benzimidazole, a quinoline, a pyrimidine, a thiadiazole,



B<sup>1</sup>  
a sulfinylnicotinamide, a thienoimidazole, or a imidazopyridine.

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B<sup>1</sup>  
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37. The compound of claim 36, wherein the benzimidazole is omeprazole, lansoprazole, pantoprazole, rabeprazole, leminoprazole, timoprazole, tenatoprazole, disulprazole, esomeprazole, 2-(2-benzimidazolyl)-pyridine, a tricyclic imidazole, a thienopyridine benzimidazole, a fluoroalkoxy substituted benzimidazole, a dialkoxo benzimidazole, a N-substituted 2-(pyridylalkenesulfinyl) benzimidazole, a cycloheptenepyrindine, a 5-pyrrolyl-2-pyridylmethylsulfinyl benzimidazole, a alkylsulfinyl benzimidazole, a fluoro-pyridylmethylsulfinyl benzimidazole, an imidazo[4,5-b]pyridine, RO 18-5362 or IY 81149; wherein the quinoline is a 4-amino-3-carbonyl quinoline, a 4-amino-3-acylnaphthyride, a 4-aminoquinoline, a 4-amino-3-acylquinoline or a 3-butyryl-4-(2-methylphenylamino)-8-(2-hydroxyethoxy)quinoline; wherein the pyrimidine is a quinazoline, a tetrahydroisoquinolin-2-yl pyrimidine or YH 1885; wherein the thiadiazole is 3-substituted 1,2,4-thiadiazolo[4,5-a] benzimidazole or a 3-substituted imidazo[1,2-d]-thiadiazole; wherein the sulfinylnicotinamide is a 2-sulfinylnicotinamide; wherein the thienoimidazole is a pyridylsulfinylbenzimidazole, a pyridylsulfinyl thieno imidazole, a theinoimidazole-toluidine, a 4,5-dihydrooxazole, a thienoimidazole-toluidine or Hoe-731; wherein the imidazopyridine is a imidazo[1,2-a]pyridine, a pyrrolo[2,3-b]pyridine or a pharmaceutically acceptable salt thereof.

Sub  
A2  
B<sup>1</sup>  
38. The composition of claim 37 further comprising a pharmaceutically acceptable carrier.

Sub  
A2  
B<sup>1</sup>  
25  
39. The composition of claim 35, wherein the compound that donates, transfers, or releases nitric oxide, or induces the production of endogenous nitric oxide or endothelium-derived relaxing factor, or is a substrate for nitric oxide synthase is an S-nitrosothiol.

Sub  
A2  
B<sup>1</sup>  
30  
40. The composition of claim 39, wherein the S-nitrosothiol is S-nitroso-N-acetylcysteine, S-nitroso-captopril, S-nitroso-N-acetylpenicillamine, S-nitroso-homocysteine, S-nitroso-cysteine or S-nitroso-glutathione.

41. The composition of claim 39, wherein the S-nitrosothiol is:

- (i)  $\text{HS}(\text{C}(\text{R}_e)(\text{R}_f))_m\text{SNO}$ ;
- (ii)  $\text{ONS}(\text{C}(\text{R}_e)(\text{R}_f))_m\text{R}_e$ ; and

(iii)  $\text{H}_2\text{N}-\text{CH}(\text{CO}_2\text{H})-(\text{CH}_2)_m-\text{C}(\text{O})\text{NH}-\text{CH}(\text{CH}_2\text{SNO})-\text{C}(\text{O})\text{NH}-\text{CH}_2-\text{CO}_2\text{H}$ ;  
 wherein m is an integer from 2 to 20;  $\text{R}_e$  and  $\text{R}_i$  are each independently a hydrogen,  
 an alkyl, a cycloalkoxy, a halogen, a hydroxy, an hydroxyalkyl, an alkoxyalkyl, an  
 arylheterocyclic ring, an alkylaryl, a cycloalkylalkyl, a heterocyclicalkyl, an alkoxy, a  
 haloalkoxy, an amino, an alkylamino, a dialkylamino, an arylamino, a diarylamino,  
 an alkylarylamino, an alkoxyhaloalkyl, a haloalkoxy, a sulfonic acid, a sulfonic ester,  
 an alkylsulfonic acid, an arylsulfonic acid, an arylalkoxy, an alkylthio, an arylthio, a  
 cycloalkylthio, a cycloalkenyl, a cyano, an aminoalkyl, an aminoaryl, an aryl, an  
 arylalkyl, an alkylaryl, a carboxamido, an alkylcarboxamido, an arylcarboxamido, an  
 amidyl, a carboxyl, a carbamoyl, an alkylcarboxylic acid, an arylcarboxylic acid, an  
 alkylcarbonyl, an arylcarbonyl, an ester, a carboxylic ester, an alkylcarboxylic ester, an  
 arylcarboxylic ester, a haloalkoxy, a sulfonamido, an alkylsulfonamido, an  
 arylsulfonamido, a sulfonic ester, a urea, a phosphoryl, a nitro, -T-Q, or  
 $(\text{C}(\text{R}_e)(\text{R}_i))_k-\text{T}-\text{Q}$ , or  $\text{R}_e$  and  $\text{R}_i$  taken together with the carbons to which they are  
 attached form a carbonyl, a methanthial, a heterocyclic ring, a cycloalkyl group or a  
 bridged cycloalkyl group; Q is -NO or -NO<sub>2</sub>; and T is independently a covalent bond,  
 a carbonyl, an oxygen, -S(O)<sub>o</sub>- or -N(R<sub>a</sub>)R<sub>i</sub>-, wherein o is an integer from 0 to 2, R<sub>a</sub> is  
 a lone pair of electrons, a hydrogen or an alkyl group; R<sub>i</sub> is a hydrogen, an alkyl, an  
 aryl, an alkylcarboxylic acid, an aryl carboxylic acid, an alkylcarboxylic ester, an  
 arylcarboxylic ester, an alkylcarboxamido, an arylcarboxamido, an alkylaryl, an  
 alkylsulfinyl, an alkylsulfonyl, an arylsulfinyl, an arylsulfonyl, a sulfonamido, a  
 carboxamido, a carboxylic ester, an amino alkyl, an amino aryl, -CH<sub>2</sub>-C(T-Q)(R<sub>e</sub>)(R<sub>i</sub>),  
 or -(N<sub>2</sub>O<sub>2</sub>-)•M<sup>+</sup>, wherein M<sup>+</sup> is an organic or inorganic cation; with the proviso that  
 when R<sub>i</sub> is -CH<sub>2</sub>-C(T-Q)(R<sub>e</sub>)(R<sub>i</sub>) or -(N<sub>2</sub>O<sub>2</sub>-)•M<sup>+</sup>; then "-T-Q" can be a hydrogen, an  
 alkyl group, an alkoxyalkyl group, an aminoalkyl group, a hydroxy group or an aryl  
 group.

42. The composition of claim 35, wherein the compound that donates,  
 transfers, or releases nitric oxide, or induces the production of endogenous nitric  
 oxide or endothelium-derived relaxing factor, or is a substrate for nitric oxide  
 synthase is L-arginine, L-homoarginine, N-hydroxy-L-arginine, nitrosated L-  
 arginine, nitrosylated L-arginine, nitrosated N-hydroxy-L-arginine, nitrosylated N-  
 hydroxy-L-arginine, citrulline, ornithine, glutamine, lysine, polypeptides

comprising at least one of these amino acids or inhibitors of the enzyme arginase.

43. The composition of claim 35, wherein the compound that donates, transfers, or releases nitric oxide, or induces the production of endogenous nitric oxide or endothelium-derived relaxing factor, or is a substrate for nitric oxide synthase is:

(i) a compound that comprises at least one ON-O-, ON-N- or ON-C-group;

(ii) a compound that comprises at least one O<sub>2</sub>N-O-, O<sub>2</sub>N-N-, O<sub>2</sub>N-S- or -O<sub>2</sub>N-C- group;

(iii) a N-oxo-N-nitrosoamine having the formula: R<sup>1</sup>R<sup>2</sup>-N(O-M<sup>+</sup>)-NO, wherein R<sup>1</sup> and R<sup>2</sup> are each independently a polypeptide, an amino acid, a sugar, an oligonucleotide, a straight or branched, saturated or unsaturated, aliphatic or aromatic, substituted or unsubstituted hydrocarbon, or a heterocyclic group, and M<sup>+</sup> is an organic or inorganic cation.

44. The composition of claim 43, wherein the compound comprising at least one ON-O-, ON-N- or ON-C- group is an ON-O-polypeptide, an ON-N-polypeptide, an ON-C-polypeptide, an ON-O-amino acid, an ON-N-amino acid, an ON-C-amino acid, an ON-O-sugar, an ON-N-sugar, an ON-C-sugar, an ON-O-oligonucleotide, an ON-N-oligonucleotide, an ON-C-oligonucleotide, a straight or branched, saturated or unsaturated, substituted or unsubstituted, aliphatic or aromatic ON-O-hydrocarbon, a straight or branched, saturated or unsaturated, substituted or unsubstituted, aliphatic or aromatic ON-N-hydrocarbon, a straight or branched, saturated or unsaturated, substituted or unsubstituted, aliphatic or aromatic ON-C-hydrocarbon, an ON-O-heterocyclic compound, an ON-N-heterocyclic compound or a ON-C-heterocyclic compound.

45. The composition of claim 43, wherein compound comprising at least one O<sub>2</sub>N-O-, O<sub>2</sub>N-N-, O<sub>2</sub>N-S- or O<sub>2</sub>N-C- group is an O<sub>2</sub>N-O-polypeptide, an O<sub>2</sub>N-N-polypeptide, an O<sub>2</sub>N-S-polypeptide, an O<sub>2</sub>N-C-polypeptide, an O<sub>2</sub>N-O-amino acid, O<sub>2</sub>N-N-amino acid, O<sub>2</sub>N-S-amino acid, an O<sub>2</sub>N-C-amino acid, an O<sub>2</sub>N-O-sugar, an O<sub>2</sub>N-N-sugar, O<sub>2</sub>N-S-sugar, an O<sub>2</sub>N-C-sugar, an O<sub>2</sub>N-O-oligonucleotide, an O<sub>2</sub>N-N-oligonucleotide, an O<sub>2</sub>N-S-oligonucleotide, an O<sub>2</sub>N-C-oligonucleotide, a straight or branched, saturated or unsaturated, aliphatic or aromatic, substituted or

Sub B1  
unsubstituted O<sub>2</sub>N-O-hydrocarbon, a straight or branched, saturated or unsaturated, aliphatic or aromatic, substituted or unsubstituted O<sub>2</sub>N-N-hydrocarbon, a straight or branched, saturated or unsaturated, aliphatic or aromatic, substituted or unsubstituted O<sub>2</sub>N-S-hydrocarbon, a straight or branched, saturated or unsaturated, aliphatic or aromatic, substituted or unsubstituted O<sub>2</sub>N-C-hydrocarbon, an O<sub>2</sub>N-O-heterocyclic compound, an O<sub>2</sub>N-N-heterocyclic compound, an O<sub>2</sub>N-S-heterocyclic compound or an O<sub>2</sub>N-C-heterocyclic compound.

46. The composition of claim 35, further comprising at least one of a nonsteroidal antiinflammatory drug, a selective COX-2 inhibitor, an antacid, a bismuth-containing reagent and an acid-degradable antibacterial compound.

47. A method for treating or preventing a gastrointestinal disorder, facilitating ulcer healing, or decreasing the recurrence of an ulcer in a patient in need thereof comprising administering to the patient a therapeutically effective amount of the composition of claim 35.

48. The method of claim 47, further comprising administering to the patient a therapeutically effective amount of an antacid.

49. The method of claim 47, wherein the gastrointestinal disorder is an inflammatory bowel disease, Crohn's disease, irritable bowel syndrome, ulcerative colitis, a peptic ulcer, a stress ulcers, a bleeding peptic ulcer, a duodenal ulcer, infectious enteritis, colitis, diverticulitis, gastric hyperacidity, dyspepsia, gastroparesis, Zollinger-Ellison syndrome, gastroesophageal reflux disease, *Helicobacter Pylori* associated disease, short-bowel syndrome, or a hypersecretory state associated with systemic mastocytosis or basophilic leukemia and hyperhistaminemia.

Sub B2  
50. A method for improving the gastroprotective properties, the anti-*Helicobacter pylori* properties, or the antacid properties of a proton pump inhibitor comprising administering to a patient in need thereof a therapeutically effective amount of the composition of claim 35.

51. The method of claim 50, further comprising administering to the patient a therapeutically effective amount of a bismuth-containing reagent.

52. A method for decreasing or reversing gastrointestinal toxicity or facilitating ulcer healing resulting from administration of a nonsteroidal

antiinflammatory drug and/or a selective COX-2 inhibitor to a patient comprising administering to a patient in need thereof a therapeutically effective amount of at least one composition of claim 35, and, optionally, at least one nonsteroidal antiinflammatory drug and/or selective COX-2 inhibitor.

5 53. A method for treating *Helicobacter pylori* comprising administering to a patient in need thereof a therapeutically effective amount of at least one acid degradable antibacterial compound and at least one composition of claim 35.

10 54. A method for treating a viral infection comprising administering to a patient in need thereof a therapeutically effective amount of the composition of claim 35.

55. The method of claim 54, wherein the viral infection is orthomyxoviridae, paramyxoviridae, picornaviridae, rhabdoviridae, coronaviridae, togaviridae, bunyaviridae, arenaviridae, reteroviridae, adenoviridae, proxviridae, papovaviridae, herpesviridae, herpesviridae, herpes simplex viruses, cytomegalovirus, herpes varicella-zoster, Epstein-Barr, HHV6, HHV7, pseudorabies or rhinotracheitis.

56. A method for preventing or treating a gastrointestinal disorder, facilitating ulcer healing, or decreasing the recurrence of an ulcer in a patient in need thereof comprising administering to the patient a therapeutically effective amount of the composition of claim 5 or a pharmaceutically acceptable salt thereof, and at least one compound that donates, transfers or releases nitric oxide, or induces the production of endogenous nitric oxide or endothelium-derived relaxing factor, or is a substrate for nitric oxide synthase.

57. The method of claim 56, further comprising administering at least one antacid.

58. The method of claim 56, wherein the gastrointestinal disorder is an inflammatory bowel disease, Crohn's disease, irritable bowel syndrome, ulcerative colitis, a peptic ulcer, a stress ulcers, a bleeding peptic ulcer, a duodenal ulcer, infectious enteritis, colitis, diverticulitis, gastric hyperacidity, dyspepsia, gastroparesis, Zollinger-Ellison syndrome, gastroesophageal reflux disease, *Helicobacter Pylori* associated disease, short-bowel syndrome, or a hypersecretory state associated with systemic mastocytosis or basophilic leukemia and

hyperhistaminemia. A

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AS  
B3  
5 59. A method for preventing or treating a gastrointestinal disorder, facilitating ulcer healing, or decreasing the recurrence of an ulcer in a patient in need thereof comprising administering to the patient a therapeutically effective amount of at least one proton pump inhibitor or a pharmaceutically acceptable salt thereof, and at least one compound that donates, transfers or releases nitric oxide, or induces the production of endogenous nitric oxide or endothelium-derived relaxing factor, or is a substrate for nitric oxide synthase.

10 60. The method of claim 59, further comprising administering at least one antacid.

61. The method of claim 59, wherein the gastrointestinal disorder wherein the gastrointestinal disorder is an inflammatory bowel disease, Crohn's disease, irritable bowel syndrome, ulcerative colitis, a peptic ulcer, a stress ulcers, a bleeding peptic ulcer, a duodenal ulcer, infectious enteritis, colitis, diverticulitis, gastric hyperacidity, dyspepsia, gastroparesis, Zollinger-Ellison syndrome, gastroesophageal reflux disease, *Helicobacter Pylori* associated disease, short-bowel syndrome, or a hypersecretory state associated with systemic mastocytosis or basophilic leukemia and hyperhistaminemia.

62. A method for improving the gastroprotective properties, the anti-*Helicobacter* properties or the antacid properties of a proton pump inhibitor compound comprising administering to a patient in need thereof a therapeutically effective amount of a bismuth complex comprising at least one composition of claim 5.

25 63. A method for improving the gastroprotective properties, the anti-*Helicobacter* properties or the antacid properties of a proton pump inhibitor compound comprising administering to a patient in need thereof a therapeutically effective amount of a bismuth complex comprising at least one composition of claim 16.

30 Sub  
B4 64. A method for improving the gastroprotective properties, the anti-*Helicobacter* properties or the antacid properties of a proton pump inhibitor compound comprising administering to a patient in need thereof a therapeutically effective amount of a bismuth complex comprising at least one composition of

Sub B4  
claim 35.

65. A method for decreasing or reversing gastrointestinal toxicity or facilitating ulcer healing resulting from administration of a nonsteroidal antiinflammatory drug and/or a selective COX-2 inhibitor to a patient comprising administering to a patient in need thereof a therapeutically effective amount of at least one composition of claim 5, and at least one compound that donates, transfers or releases nitric oxide, or induces the production of endogenous nitric oxide or endothelium-derived relaxing factor, or is a substrate for nitric oxide synthase, and, optionally, at least one nonsteroidal antiinflammatory drug and/or selective COX-2 inhibitor.

Sub A6 B5  
66. A method for decreasing or reversing gastrointestinal toxicity or facilitating ulcer healing resulting from administration of a nonsteroidal antiinflammatory drug and/or a selective COX-2 inhibitor to a patient comprising administering to a patient in need thereof a therapeutically effective amount of at least one proton pump inhibitor compound, and at least one compound that donates, transfers or releases nitric oxide, or induces the production of endogenous nitric oxide or endothelium-derived relaxing factor, or is a substrate for nitric oxide synthase, and, optionally, at least one nonsteroidal antiinflammatory drug and/or selective COX-2 inhibitor.

67. A method for treating *Helicobacter pylori* comprising administering to a patient in need thereof a therapeutically effective amount of at least one acid degradable antibacterial compound, at least one composition of claim 5 or a pharmaceutically acceptable salt thereof, and at least one compound that donates, transfers or releases nitric oxide, or induces the production of endogenous nitric oxide or endothelium-derived relaxing factor, or is a substrate for nitric oxide synthase.

Sub A7 B6  
68. A method for treating *Helicobacter pylori* comprising administering to a patient in need thereof a therapeutically effective amount of at least one acid degradable antibacterial compound, at least one proton pump inhibitor compound or a pharmaceutically acceptable salt thereof, and at least one compound that donates, transfers or releases nitric oxide, or induces the production of endogenous nitric oxide or endothelium-derived relaxing factor, or is a substrate for nitric oxide

Sub  
A7  
cont  
synthase.

69. A method for treating a viral infection comprising administering to a patient in need thereof a therapeutically effective amount of at least one composition of claim 5 and at least one compound that donates, transfers or releases nitric oxide, or induces the production of endogenous nitric oxide or endothelium-derived relaxing factor, or is a substrate for nitric oxide synthase.

70. The method of claim 69, wherein the viral infection is orthomyxoviridae, paramyxoviridae, picornaviridae, rhabdoviridae, coronaviridae, togaviridae, bunyaviridae, arenaviridae, reteroviridae, adenoviridae, proxviridae, papovaviridae, herpesviridae, herpes simplex viruses, cytomegalovirus, herpes varicella-zoster, Epstein-Barr, HHV6, HHV7, pseudorabies or rhinotracheitis.

71. A method for treating a viral infection comprising administering to a patient in need thereof a therapeutically effective amount of at least one proton pump inhibitor compound or a pharmaceutically acceptable salt thereof, and at least one compound that donates, transfers or releases nitric oxide, or induces the production of endogenous nitric oxide or endothelium-derived relaxing factor, or is a substrate for nitric oxide synthase.

72. The method of claim 71, wherein the viral infection is orthomyxoviridae, paramyxoviridae, picornaviridae, rhabdoviridae, coronaviridae, togaviridae, bunyaviridae, arenaviridae, reteroviridae, adenoviridae, proxviridae, papovaviridae, herpesviridae, herpes simplex viruses, cytomegalovirus, herpes varicella-zoster, Epstein-Barr, HHV6, HHV7, pseudorabies or rhinotracheitis.

73. A kit comprising at least one compound of claim 2 or a pharmaceutically acceptable salt thereof, and at least one compound that donates, transfers or releases nitric oxide, or induces the production of endogenous nitric oxide or endothelium-derived relaxing factor, or is a substrate for nitric oxide synthase.

74. The kit of claim 73, wherein the compound of claim 2 or a pharmaceutically acceptable salt thereof, and the at least one compound that donates, transfers or releases nitric oxide, induces the production of endogenous



nitric oxide or endothelium-derived relaxing factor, or is a substrate for nitric oxide synthase are separate components in the kit or are in the form of a composition in the kit.

75. The kit of claim 73, further comprising at least one of a nonsteroidal antiinflammatory drug, a selective COX-2 inhibitor, an antacid, a bismuth-containing reagent and an acid-degradable antibacterial compound.

76. A kit comprising at least one proton pump inhibitor compound or a pharmaceutically acceptable salt thereof, and at least one compound that donates, transfers or releases nitric oxide, or induces the production of endogenous nitric oxide or endothelium-derived relaxing factor, or is a substrate for nitric oxide synthase.

77. The kit of claim 76, wherein the proton pump inhibitor compound or a pharmaceutically acceptable salt thereof, and the compound that donates, transfers or releases nitric oxide, or induces the production of endogenous nitric oxide or endothelium-derived relaxing factor, or is a substrate for nitric oxide synthase are separate components in the kit or are in the form of a composition in the kit.

78. The kit of claim 76, further comprising at least one of a nonsteroidal antiinflammatory drug, a selective COX-2 inhibitor, an antacid, a bismuth-containing reagent and an acid-degradable antibacterial compound.

add  
B8

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C6